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NEUTRALIZATION:

THE ARCHIPHONEME AND PHONOLOGICAL REDUNDANCY



by

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A faint, grayscale background image of a classical building, possibly a temple or a government building, featuring four prominent columns and a triangular pediment at the top. The building is centered and serves as a subtle backdrop for the text.

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ABSTRACT

Two theoretical frameworks, the functional-structural and the generative phonological, are compared with respect to their treatment of phonological redundancy. Historical and contemporary similarities between these two frameworks motivate their choice for comparison, and help in a clarification of certain controversial areas in current phonological theory. Specifically, the development of the notions of archiphoneme and neutralization is traced from their origin to their incorporation into present theories. It is shown how a detailed consideration of the archiphoneme led to a redefinition of the phoneme as a bundle of distinctive features, and how the notion of archiphoneme as first conceived was an attempt (in part) to account for phonological redundancy. It is further shown how this concept, if fully applied, obviates the need for many of the phonotactical statements. In addition, the archiphonemic level and a comparable redundancy-free representation in generative phonology are examined. Finally, a new theory of markedness, replacing earlier generative formulations, is discussed, and it is shown how this theory accounts for much redundancy and establishes connections between other areas of investigation.

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CHAPTER ONE

1.0. Purpose. The phenomenon of neutralization, or the suspension of phonemic oppositions in certain contexts, has been variously treated in modern linguistic theories, most recently through its incorporation in a theory of phonological markedness. It is the purpose of this thesis to analyze two of these treatments, the functional-structural and the generative phonological (including markedness) and to show their basic concern with the question of phonological redundancy. It will further be shown how studies of phonotactics, within the above-mentioned approaches as well as within the American structuralist tradition, also involve the notion of redundancy. Finally, a theory of markedness, still in its infancy, will be reviewed in an attempt to show how it deals with much of the information handled by redundancy theories, and provides an explanation for other phenomena as well. This chapter provides a general introduction to the thesis, and establishes certain broad frames of reference within which the inquiry is carried on.

1.1. Motivation. The functional-structural and generative phonological frameworks have been examined for three principal reasons. First, there is a definite historical connection between them, since to a large extent they both originate in the work of the Prague circle of the 1930's. Secondly, in current practice, they are comparable with respect to certain important areas of

phonological investigation: mainly (within this thesis) partially specified levels of representation and the naturalness condition. Third, a comparison of the two approaches can help in the clarification of certain points in the current debate concerning the validity of particular levels of phonological representation¹ (see Chapter Four).

1.2. General Characteristics. One of the concerns of the functional-structural approach is the establishment of the correlations within the phonemic paradigm,² based on a determination of the function of particular phonetic features. In the American structuralist tradition, on the other hand, linguists are not generally concerned³ with the phonemic paradigm. The inventory of phonemes is established syntagmatically through a study of distributional classes of phonetically similar

¹ Phonological representation refers to levels more abstract, less directly related to the physical sound, than the phonetic level.

² "Paradigmatic" refers to the relations among units that may occupy the same slot in the stream of speech. "Syntagmatic" refers to elements following one another in linear succession in the stream of speech. See, for example, the definitions in Pei, Glossary of Linguistic Terminology.

³ As an illustration of this, Chomsky and Halle cite (1968, p. 293) "the numerous articles on phonological subjects that have appeared in the last thirty years in journals such as the International Journal of American Linguistics in which information concerning the phonetic properties of the phonemes of a language is often restricted to a simple listing of alphabetic symbols."

segments, and the neutralization of phonemic oppositions is not considered. That is, phonetic criteria⁴ enter into the definition of the phoneme only in the form of a requirement that phonemes be phonetically similar, and the phonological components of a phoneme are not considered. Phonemes are generally considered as indivisible units, rather than as composed of features.

In even more general terms, however, it is possible to group the functional-structural and the American structural approaches together (in spite of the considerable differences between them) under the heading of autonomous (formerly taxonomic) phonemics, and to contrast autonomous phonemics with what has been called systematic phonemics.⁵ Systematic phonemics is the type of phonology practiced within generative phonology. The major distinguishing characteristic of autonomous phonemics is its reliance on phonetic information only, plus a knowledge that two utterances are different in meaning in establishing the phonemic inventory.⁶ Thus, for an autonomous phonologist, as Martinet says (1964, p. 12), ". . . everything that counts in language is represented, in one guise or

⁴A distributional criterion is importantly involved in this approach; namely, the factor of complementary distribution.

⁵As is done, for example, in Chomsky (1964, p. 91), Postal (1968, pp. x-xiii).

⁶See Postal (1968, pp. x-xi).

or another, at every point in the circuit of speech."

Systematic phonemics (transformational grammar in general), on the other hand, allows the use of syntactic and semantic information plus introspection on the part of the analyst or his informant. Systematic phonemics has been compared, with some justification regarding one or two points, to the morphophonemics of other approaches (see Postal, 1968, p. xii). Both levels involve abstract base forms that are not constructed following the constraints placed on the phonemic level.

Both involve a single base form for each morpheme.⁷ However, the differences between the two levels are important as well. For example, the systematic phonemic representation includes grammatical information, whereas the morphophonemic representation does not. Morphophonemes are unanalyzable units, while systematic phonemes are composed of binary distinctive features. The merits of one approach versus the other are not under consideration here, but the differences between the two should be kept in mind.

1.3. Historical Survey. Within functional-structural theory, the concept of the archiphoneme was introduced by Roman Jakobson in 1929 (*Remarques . . .*, p. 12). The archiphoneme is the common base of comparison of two phonemes in exclusive

⁷That is, on the morphophonemic level in the American structuralist tradition, there is one morphophonemic representation per morpheme, the allomorphs of which have various representations on the phonemic level.

relationship that appears in phonological representations in positions of neutralization. Following Jakobson's formulation, the Prague and post-Prague phonologists expanded on the idea and developed a theory describing the functioning or non-functioning of certain distinctive phonological features in particular syntagmatic contexts. The concept was incorporated into the "Projet de terminologie phonologique standardisée" (TCLP IV, 1931, pp. 309-323) as part of a larger phonological theory. Trubetzkoy was one of the major proponents of the theory, dealing with neutralization in two principal works: "Die Aufhebung der phonologischen Gegensätze" and Grundzüge der Phonologie.⁸ Martinet and Hjelmslev also contributed to the basic development of the theory; Martinet⁹ principally in his article "Neutralisation et archiphonème" (but see as well Martinet, 1949b, 1956, 1960), and Hjelmslev in his "Note sur les oppositions supprimables." Cohen (1965) gives a brief critical discussion of the concepts of neutralization and archiphoneme in his treatment of the phonemes of English.

Within generative phonology, the equivalent of neutralization has been dealt with by a set of rules which fill in redundant feature information. The theoretical development of these redundancy (or morpheme structure) rules has taken place mainly in Halle (1959), McCawley (1965), and Stanley (1967).

8

From now on, reference will be made to the French translation, Principes de phonologie, Paris, 1949.

9

For an application of the theory to specific languages, see Martinet (1937, 1945).

With the notable exception of Halle's The Sound Pattern of Russian, works within this framework dealing with specific languages rather than the development of the theory have not touched on the redundancy rules, but deal instead with the phonological rules proper. Thus, while generative phonological treatments of certain areas are not lacking, there is a gap with respect to redundancy that needs to be filled.¹⁰

Because both the functional-structural and generative phonological approaches stem in part from the work of the Prague circle, certain definitions proposed by this latter group will be of use in the following discussion. Within the Prague school theories, a phoneme was at first defined as a "unité phonologique non-susceptible d'être dissociée en unités plus petites et plus simples" (Projet de terminologie phonologique standardisée, TCLP IV, p. 311). A "unité phonologique" and an "opposition phonologique" as a "différence phonique susceptible de servir, dans une langue donnée, à la différenciation des significations intellectuelles."

¹⁰ For works which deal extensively with analyses of particular languages from the point of view of generative phonology, but which omit treatments of redundancy, see J. Harris (1967), Kuroda (1967), McCawley (1965), Schane (1968a), Zwicky (1965). For a brief survey of the theory, see Langacker (1968, pp. 157-160).

CHAPTER TWO

2.0. Purpose. It is the purpose of this chapter to trace the history of the archiphoneme from its inception in the linguistic theories of the Prague school phonologists to its use in the modern phonological theories which have evolved more or less directly from them.

2.1. Origin of the Archiphoneme. The concept of the archiphoneme was first introduced in print by Roman Jakobson in 1929. In *Remarques sur l'évolution phonologique du russe* (p. 12), he says,

"En prenant pour point de départ la délimitation des notions établies ci-dessus, nous pouvons dégager une entité nouvelle, à savoir l'archiphonème . . . L'archiphonème est une idée générique, c'est une unité abstraite qui peut unir un ou plusieurs couples de variantes correlatives (de phonèmes correlatifs)."

While the succinct definition of this new concept later given in the "Projet de terminologie" mentioned above, is missing from Jakobson's paper, he illustrates the new concept with examples from contemporary literary Russian. Among the examples are the well-known neutralizations of the palatalized-non-palatalized opposition in various positions, and the voiced-voiceless opposition in word-final position.

Jakobson's formulation engendered considerable discussion in the linguistic literature. In the "Projet de terminologie" (P. 311) the archiphoneme is defined as "l'élément

commun de deux ou plusieurs phonèmes correlatifs, qu'on peut concevoir abstraction faite des propriétés de correlation;" that is, the common element or archiphoneme consists of the relevant phonetic properties common to two or more correlated phonemes. Such a definition clearly presupposes a componential definition for the phoneme¹ (rather than a distributional one), and this foundation is ultimately provided by the theory of phonologic correlations. This theory gives the particular features which function as components of individual phonemes or groups of phonemes.

2.2. Classification of Phonemic Oppositions. Phonological oppositions may be classified in different ways. In an early study, Trubetzkoy (1936b) differentiates between bilateral and multilateral, between proportional and isolated, between privative, gradual and equipollent, and, of central interest here, between constant and neutralizable oppositions. This classification is essentially the one carried over into Principes de phonologie. A bilateral opposition is one in which the set of features common to two phonemes appears only in that pair. Thus the French pair /p-b/² form a bilateral

¹The definition of the phoneme given in the "Projet de terminologie" is non-componential, and the conflict between this and the concept of the archiphoneme led to certain difficulties. See Section 2.5 below.

²In this thesis, standard practice will be followed in enclosing phonemes in slant lines. Where it is necessary to distinguish autonomous phonemes from systematic phonemes, slant lines will enclose the former, straight vertical lines the latter.

opposition, since they are the only non-nasal labials in the system.³ In a multilateral opposition, the common base of comparison between two phonemes is also shared by at least a third phoneme. For example, the opposition between the voiceless stops /p-t/ in English is multilateral because there is a third phoneme /k/ which is also a voiceless stop. An opposition is proportional if the relationship between its members is identical to that between the members of other oppositions in the same system. Thus French /p-b/ form a proportional opposition because /p/ has the same relation to /b/ (voicelessness to voice) as /t/ to /d/, /k/ to /g/, /f/ to /v/, etc. On the other hand, an opposition is isolated if the relationship between its members is not found elsewhere in the same phonemic system. In Spanish, /r/ and /rr/ form such an opposition. In French, /r/ and /l/ are isolated phonemes opposed to the rest of the system. In Italian, however, the opposition /r-rr/ is proportional, since it participates in a correlation of gemination.

The classifications presented so far are based on the relationship of individual phonemes to the whole system of

3

See Martinet (1964, p. 65) for a description of French in these terms.

oppositions, and may be used to form a four-way division. For example, an opposition may be bilateral and proportional, multilateral and proportional, bilateral and isolated, or multilateral and isolated.⁴ A further three-way classification may be made depending on the relationship between members of individual oppositions. The members may form privative, gradual, or equipollent oppositions. As Dorfman points out (1968, p. 92), a privative opposition is formed by two members, "one of which is characterized by the presence, the other by the absence of the distinctive feature or mark of correlation." In a gradual opposition, the members present different degrees of the same phonologic quality. An equipollent opposition is formed by "two members which do not represent the presence or absence of a mark, nor a difference of degree, but which are on the same plane with reference to their common base of comparison" (ibid., p. 94). Illustrating from the French vocalic system, the pairs /ɛ-ɛ̃/ and /ə-ə̃/ form privative oppositions; /i-e-ɛ-a/ form gradual oppositions, and /i-ü-u/ or /e-ø-o/ form equipollent oppositions.

The above classifications refer to oppositions as they occur in the phonemic paradigm, rather than in the syntagm.⁵

⁴ There is a fifth division needed to complete the system, that of isolated phonemes opposed to the whole system, as the example of /r/ in French shows.

⁵ Martinet (1964, p. 104) uses "syntagm" to refer to arrangements of units on the morphological level. The term may apply just as well, however, to linear arrangements of units on the phonological level.

They are paradigmatic rather than syntagmatic. As soon as phonemes occur in linear sequence, it is discovered that not all oppositions may occur in all positions in the syntagm. Some oppositions, such as standard English high-mid in the vowels may occur without constraint. These are called constant oppositions. Other oppositions, however, are restricted to certain positions. For example, the difference between /e/ and /ɛ/ in French is relevant only in word-final open syllables. In other positions the occurrence of either /e/ or /ɛ/ is determined by syllable structure or is, in certain cases, in free variation. That is, the open-closed opposition between them is neutralized because it does not serve to differentiate meanings in these neutralizing positions. In these positions, in phonological representation, the segment is represented by the archiphoneme⁶ in order that only features which are distinctive appear on this level. Neutralization, therefore, is the non-functioning of a specific distinctive feature or mark of correlation in a particular context.⁷ A fairly extensive theory of neutralizations has been developed using the classifications of oppositions

⁶ See, for example, Martinet (1936), Llorach (1965, p. 48).

⁷ This definition does not fit the non-functioning of the opposition /h/ versus /j/ in English, which is not considered as neutralized because these phonemes do not have a mark of correlation distinguishing them.

outlined above.

2.3. Neutralizable Oppositions. In "Die Aufhebung der phonologischen Gegensätze", largely duplicated in Principes de phonologie, Troubetzkoy differentiates between combinatory variants and constant and neutralizable oppositions, remarking on their psychological status.⁸ He says that,

"Les oppositions phonologiques constantes sont perçues, même par les membres sans éducation phonétique de la communauté linguistique, et les termes d'une de ces oppositions sont considérés comme des "individualités phoniques" différentes. Dans les oppositions phonologiques neutralisables, la perception est hésitante: dans les positions de pertinence, les deux termes de l'opposition sont nettement distingués, mais par contre dans les positions de neutralisation on est souvent hors d'état d'indiquer lequel des deux termes a été exactement prononcé ou entendu. Mais même dans les positions de pertinence on sent les termes d'une opposition neutralisable seulement comme deux nuances différenciant des significations, comme deux unités phoniques à la vérité différentes mais cependant étroitement apparentées l'une à l'autre, et ce sentiment de parenté intime est particulièrement caractéristique des termes de ces oppositions." (1949, p. 81).

For example, as Martinet has observed (1949b, p. 45), acoustically there is just as much difference between French /e/ and /ɛ/ as there is between /i/ and /e/, yet /e/ and /ɛ/ are felt as linked in a way that /i/ and /e/ are not, because the difference

⁸For further remarks on the psychological status of phonemic oppositions, see Martinet (1949b, pp. 5-7) and Sapir (1949).

between them may be neutralized. Trubetzkoy assigns more than a psychological importance to the difference between constant and neutralizable oppositions. The difference also has relevance for the functioning of the phonologic system in that it frequently indicates the type of relationship between phonemes, and the status of particular phonemic oppositions.

Phonemic analysis within this tradition consists, in part, of removing the specification of redundant phonetic properties from the individual segments, arriving ultimately at a set of distinctive (that is, non-redundant, non-predictable) phonologic oppositions. For example, given the English phone [p'] which, in final position in [nIp'] is:

| |
|--------------------|
| bilabial |
| non-nasal |
| occlusive |
| voiceless |
| non-aspirate |
| tense |
| non-released |
| non-glottalized |
| non-rounded |
| non-pharyngealized |
| . |
| . |
| . |

An analysis following functional-structural principles will arrive at a representation of the phoneme /p/ consisting of the following set of distinctive features or correlations:

(bi)labial⁹
non-nasal
occlusive
voiceless

These features are the only ones which, if changed, will produce a change of phoneme (in English). The other phonetic properties are accounted for either by general rules of the English language, such as nasals are articulated as voiced phones, no English segments are pharyngealized, etc., or by statements of combinatory or optional variants, such as final stops may be unaspirated and unreleased. These considerations introduce the possibility of a new definition of the phoneme, later adopted in the approaches considered here. This new definition will be discussed below.

Within the context above, neutralization may also be viewed as the removal of redundant (non-distinctive) features from the phonological representation. The features are redundant, in this case however, with reference to other features in neighbouring segments, not with reference to features in the same segment. For example, because the English segment /p/ is itself voiceless, it does not make distinctive use of the feature of tenseness, which is redundant and

⁹The phoneme /p/ may be classified as simply labial, rather than bilabial, because in English the homorganic opposition /č-š/ shows the minimal difference is stop versus fricative, and that the bilabial-labiodental difference in order is redundant. See Dorfman (1968, pp. 52-53).

consequently predictable. But in addition, given the neighbouring segment /s/ in /spIn/, the voicelessness of /p/ is also non-distinctive, and its absence may be predicted by general rule, since stops occurring after initial /s/ in English are always phonetically voiceless. But phonemically, there is no possibility that the opposition /p-b/ can differentiate meaning here, as it can in other positions. The preceding statements concerning the components of phonemes more fully characterize the notion of "élément commun de deux ou plusieurs phonèmes . . ." than the earlier definition of the "Projet de terminologie."

Trubetzkoy maintained (1949, p. 81) that only bilateral oppositions could be neutralized. It appears, however, that a misinterpretation of Jakobson's original formulation (1929, p. 12) lies behind this assertion.¹⁰ That is, where Jakobson stated that the archiphoneme could ". . . unir deux ou plusieurs couples de variantes . . .," Trubetzkoy requires that the archiphoneme be the ". . . ensemble des particularités distinctives qui sont communes aux deux phonèmes" (1949, p. 81, my emphasis). In a multilateral opposition there are more than two phonemes sharing the same

¹⁰ The extent to which Trubetzkoy based himself on Jakobson's earlier formulations is not obvious. But see, for example, the footnotes on pages 37, 40, 81 in Principes de phonologie, in which he credits Jakobson with the original definitions.

features, and from this observation it would be a small step to restricting neutralization to bilateral oppositions, in which only two phonemes share the features. Martinet has observed in this regard, however, that the multilateral nasal opposition /m-n-ñ/ in Spanish is neutralized in word-final position, only /n/ appearing (1956, p. 42). A comparable neutralization of the English nasal takes place before the consonants /p-t-k/ in the words impossible, intelligent, and incongruous. Hockett has pointed out (1955, p. 165) the neutralization of the multilateral opposition between the stops /p-t-k/ in some Chinese dialects, only /t/ appearing finally. In the light of the above examples, from the point of view of oppositions considered in relation to the whole system, both bilateral and multilateral oppositions may be neutralized, not just bilateral oppositions as Trubetzkoy first asserted.¹¹

Trubetzkoy further maintained that the phonological entity appearing in the position of neutralization is completely different from any of the neutralized phonemes. He says (1933, p. 239), concerning the neutralization of the French opposition /p-b/ before /t/ and /d/:

". . . au point de vue phonétique, cette troisième occlusive coincide toujours avec l'une des deux autres (avec la sourde dans apte ou avec la sonore dans abdiquer), mais du point de vue phonologique, c'est un phonème à part."

¹¹ Martinet states that it is not the bilateral or multilateral nature of the opposition that is important, but the fact that the phonemes are in exclusive relationship, that is, they are the only ones sharing their common base of comparison, and differ by a single feature. See Martinet (1949b, p. 7; 1956, pp. 41-42).

Martinet, among others, disagrees with this point as well, and in his article "Neutralisation et archiphonème" presents a different position (1936, pp. 38-45). He remarks first that Trubetzkoy's formulation would result in a proliferation, to an extreme degree, of a number of phonemes if every product of neutralization were considered as a separate phoneme,¹² and one should

"se refuser à gonfler démesurément l'inventaire des phonèmes des différentes langues en attribuant la valeur d'un phonème distinct au résultat de toutes les neutralisations, sans pour cela méconnaître l'importance de la neutralisation lorsqu'il s'agit de dresser le système phonologique d'une langue donnée." (1936, p. 48).

Instead, Martinet suggests that the archiphoneme is a comparable but more inclusive unit than the phoneme, in the sense that it is a simple phonological unit that is opposed to other phonological units, both phonemes and archiphonemes, but that as well it is differentiated in certain positions (that is, in positions of relevance, which may be in the great majority in a language) into separate phonemes. This conception of the archiphoneme accounts more clearly for the fact that the members of a neutralizable opposition are felt as more closely linked than the members of a non-neutralizable one, according to native speakers. In French, for example, /e/ and /ɛ/ form an archiphoneme which may be

¹² Reminiscent of Twaddell's multiplication of phonemes in "On Defining the Phoneme."

opposed to the other phonemes (as in cite, cette, /sit/ : /sEt/, where E is the archiphoneme), and which, in final open syllables, is differentiated into the separate phonemes /e/ and /ɛ/ (as in fee, fait, /fe/ : /fɛ/. See Martinet, La Prononciation du français contemporain, (1946, passim).

2.4. Phonetic Realization of the Archiphoneme. One of the most interesting aspects of Trubetzkoy's theory of neutralization concerns the phonetic realization of the archiphoneme in positions of neutralization. First, the representative of the archiphoneme may be phonetically distinct from any of the members of the phonemic oppositions which combine to form the archiphoneme (or which result from the differentiation of the archiphoneme in Martinet's scheme). Or, if the representative is identical (or closely similar) to one of the opposition members, this similarity may be the result of either internal or external conditioning. If the representative of the archiphoneme is externally conditioned, it depends on some feature of the immediate context to determine its phonetic form; for example, the externally conditioned neutralization, through assimilation to the voicing of the following continuants, of the oppositions /θ-d/ and /f-v/ in the English sequences /θs/, /dʒ/, /fs/, and /vz/.¹³ If the representative of an

¹³ Actually, on a strictly phonological basis, there is difficulty in determining the direction of assimilation. See Stanley (1967, p. 435).

archiphoneme is internally conditioned, its phonetic form depends not on the context, but on the structure of the phonemic system of which it forms a part. If, in this conception, the representative of a neutralized privative opposition is internally conditioned, it is always the unmarked member of the pair. On the other hand, the representative of a gradual opposition, if internally conditioned, is the extreme member of the opposition, where extreme means either the minimum or the maximum degree of the property under consideration, such as degree of aperture in vowels. These conclusions have been put to use in generative phonology to solve certain problems of phonological representation.

2.5. Redefinition of the Phoneme. According to the original definition of the "Projet de terminologie," the phoneme was the ultimate phonological unit, incapable of being subdivided into smaller or simpler units. But if the phoneme is an indivisible unit, there is no generally acceptable way of precisely determining the common element which two or more phonemes share, and which determines their archiphoneme. The original monolithic definition of the phoneme caused certain difficulties with the notion of the archiphoneme, and eventually led to the abandonment of the latter by certain linguists. There is an alternative solution, however, more widely adopted and exemplified most clearly in the work of Martinet, for example in La Description phonologique. This solution

involves regarding not the phoneme but the articulatory (or acoustic) feature as the ultimate phonological constituent.¹⁴

The phoneme is then defined, within this approach, as a minimal simultaneous bundle or set of these features. An archiphoneme is a subset of the features of two or more phonemes, namely all those features which they have in common and which remain distinctive in particular contexts. It is now possible to conceive of an archiphonemic level of representation, obtained from the phonemic by the removal of some of the sequential redundancies involving distinctive features; that is, by considering features which are distinctive only in certain positions. This archiphonemic level is a very important one in present-day phonological theory, and it has inspired a great deal of discussion. Basically the controversy involves the validity of assigning independent status to the phonemic level. Much of it is irrelevant to the present study,¹⁵ but those aspects dealing with neutralization may help contribute

¹⁴ There has been a lively discussion, beyond the scope of this thesis, concerning the validity of particular sets of features and the theoretical foundations for these features. Here, when Martinet's position is under consideration, for example, his features will be adopted. In the sections on generative phonology, the Jakobsonian features or modifications of them will be employed. For discussions of particular sets of features, see Martinet (1955, 1956), Jakobson, Fant, and Halle (1953), Jakobson and Halle (1956).

¹⁵ For an extended discussion of the question, see Halle (1959), Chomsky (1964), Postal (1968), and the numerous references cited in these works.

to a clarification of the problem.

2.6. Summary. An archiphoneme as envisaged so far may be defined as a phonological unit on a level obtained from the phonemic level by the "removal" of certain features which become redundant in specific contexts. Phonological representations on the archiphonemic level, therefore, are redundancy-free. That is, they exclude any non-distinctive features (but only to a certain extent within the theory as applied so far; see Chapter Three). There is a fairly well-developed theory of the phonetic realization of archiphonemes, involving the notions of external conditioning (basically assimilation) and internal conditioning (centered around the theory of phonological markedness advanced by Trubetzkoy). With respect to one or two points, this theory of neutralization (and particularly its application to specific languages) needs to be re-examined.

CHAPTER THREE

3.0. Purpose. A re-examination of the theory of neutralization as outlined so far shows that the theory has not yet been applied to its full extent in the determination of the archiphonemes of specific languages. A complete application, that is, the removal of all redundancies on the archiphonemic level, greatly expands the data covered by the theory. An investigation of two additional notions, those of "phonotactics" and "accidental gap," helps to exemplify the additional coverage of data.

3.1. Phonotactics. The term "tactics" was introduced by Hockett in 1947 ("Review of Nida, Morphology: The Descriptive Analysis of Words, p. 274) with reference to the arrangements in which morphemes occur. "Phonotactics" is clearly derived from this term. The need for something like phonotactical analyses was stated at least as early as de Saussure in Course in General Linguistics (p. 50): ". . . there is room for a new science that uses sequences of phonemes as a point of departure . . .," and (p. 51): "The importance of combinatory phonology in general linguistics is obvious." The study of phonotactics involves the restrictions placed on sequences of phonemes within certain grammatical units. There are, for example, numerous restrictions on English morpheme-initial consonant clusters. No four consonant clusters appear in this position. All three consonant clusters

start with /s/ and end with /r/ or /l/, and so on.¹ A phonotactical description must include a classification of the types of sequences which may occur, the number and order of phonemes permitted in the various positions, and the positions (initial, medial, final) in the larger grammatical units in which the sequences occur. The description must also conversely specify the prohibited combinations and orderings of phonemes.² In other words, a complete syntagmatic classification of the phonemes is required.

3.2. Accidental Gap. The notion "accidental" or "lexical gap" does not involve the restrictions placed on phoneme sequences in the sense just outlined. It involves instead combinations of phonemes permissible according to the distributional rules, but not actually occurring in the lexicon of the language. A native speaker would accept a phoneme sequence filling one of these gaps as a possible word in his language, one which follows all the rules, but which is unknown to him. As Vachek states in the Dictionnaire de linguistique de l'école de Prague (1960, p. 53),

¹For detailed analyses of English morpheme initial clusters, see B.L. Whorf, "Linguistics as an Exact Science," reprinted in Whorf (1956), and Z. Harris, Structural Linguistics, pp. 152-155. For a general discussion of English phonotactics, see Hill (1958, chap. 6).

²For an extended discussion of the requirements on phonotactical descriptions, see Trubetzkoy (1949, chap. VI).

"Il faut faire une différence exacte entre la neutralisation et la simple non-existence de l'opposition phonologique laquelle, il est vrai, lui ressemble au point de vue extérieure, mais au point de vue de la structure, elle en diffère totalement."

Accidental gaps must be distinguished from neutralizations³ because it is always possible for gaps to be filled (through borrowing or invention, for example) without disrupting the phonological system. Gaps, such as the potential English words zik, stip, etc., exist through the absence of one of the members of the opposition in a particular environment. In neutralization, on the other hand, it is not a question of the absence of one of the opposition members, because the opposition itself is prohibited. The existence of a form utilizing the feature being neutralized is ruled out by the structure of the language at that particular time.

3.3. Extension of neutralization. Neutralization, as described in the preceding chapter, involves the redundancy of a distinctive feature in a particular context. There is no need to restrict the possibility of redundancy to a single distinctive feature within the segment, however. Two features may be neutralized simultaneously; for example, both the features of voicing and

³ Vogt (1954) makes a comparable distinction between structural laws, which, through the use of phonetic features, define classes of segments which may not occur in certain positions, and chance distribution, which involve the accidental non-occurrence of individual phonemes in particular positions.

palatalization⁴ may be neutralized in certain Russian segments ("Projet de terminologie," pp. 315-316). Llorach also recognizes the fact that more than one feature can be neutralized.

Referring to the Spanish system, he says (1964, p. 180),

"Todos los diecinueve fonemas consonantes no conservan su validez diferencial en todas las posiciones de la cadena hablada, es decir, en determinadas circunstancias, una o varias de las propiedades pertinentes características de un fonema cesa de ser distintiva, y este fonema deja de diferenciarse del fonema o fonemas de que normalmente se distingue" (my emphasis).

Examples of the neutralization of more than one feature are provided from the Spanish system (1964, p. 183), where,

"La oposición lateral/intermitente de los archifonemas L/R muestra su carácter privativo y bilateral en la lengua vulgar o dialectal, que la suprime a veces,"

or, with respect to the features of voicing and occlusivity (p. 184),

"Las restantes neutralizaciones pertenecen todas al tipo de correlación sorda/sonora, y, por tanto, conjuntamente, al de plosión/fricción. El hecho es que en la distensión silábica ni la sonoridad ni la fricción son características pertinentes: carece de valor fonológico en esta posición la distinción entre p/b, t/d, k/g (y en el habla vulgar θ/d)."

⁴It is possible to say that in this case, voicing and palatalization combine to form a single complex feature which is neutralized, maintaining the requirement that only single features be neutralized. This reduces the issue to a terminological dispute however, since the question then arises as to the difference between simple and complex features, and the type of complex features which may be neutralized.

In as much as phonemes are bundles of features, phonotactical rules also deal with the redundancy of feature specifications, since the constraints placed on phoneme combinations inherently specify the redundancy involved in these combinations, as in, for example, English morpheme-initial consonant clusters.

If the second member of the cluster is a true consonant (excluding therefore /r/ and /l/ which, in generative phonological terms at least, are not true consonants, but liquids), the first member of the cluster must be /s/. Therefore, since /s/ is a mnemonic notational device representing a bundle of features, the only feature that is relevant in this position is consonantal versus vocalic.⁵ Given the feature "consonantal" in the phonological representation, all the remaining features which form the phoneme /s/ can be predicted: voiceless, hissing, non-nasal. Similarly, if the third member of the cluster is also consonantal (including liquids), by virtue of its position it must be either /r/ or /l/. The fourth segment in the sequence must be a vowel. /t/ or /d/ (or their archiphoneme) cannot precede /l/ in an initial cluster. The list of such sequential redundancies can be greatly extended to include all the constraints placed on the sequences of

⁵ In this example, Martinet's rather than the Jakobsonian features are used, although in this particular case the results would be identical.

phonemes by the phonotactical rules. The difficulty here, however, is that there is no theoretical means of differentiating this type of redundancy from that which is commonly subsumed under the name of neutralization.

The slot in initial position preceding stops in English exemplifies the situation in which the opposition of /s/ to every other consonant in the system is neutralized; that is, the oppositions hissing-hushing (/s-š/), voiced-voiceless (/s-z/), stop-fricative (/s-t/), etc. -- all oppositions except consonantal-vocalic -- are neutralized. The situation is analogous to that involving the neutralization of the voiced-voiceless opposition after /s/ in English. Since /p/ cannot be opposed to /b/ in this position, for example, it is neither the phoneme /p/ nor the phoneme /b/ which occurs, but those features which they have in common. In the initial slot preceding stops, therefore, it is not the segment /s/ which occurs on the archiphonemic level, but that which /s/ has in common with every English consonant, namely its consonantal quality, a single feature. In other words, it is possible for all features except one to be neutralized in certain positions. The preceding arguments demonstrate that neutralization and phonotactics may be combined in a level of representation from which all feature redundancies, both segmental and sequential, are removed. In fact, the notion of the archiphoneme, which requires that only those features which are distinctive be

included in this level of representation, seems to imply just this when pushed to its logical conclusions.

3.4. Justification of Extension. It may be argued, however, that the extension of the theory in this manner results in a needless proliferation of the number of archiphonemes. Martinet (1936) used this type of argument in disputing Trubetzkoy's claim that archiphonemes were different and separate types of phonemes. Such an argument is, however, invalid in this case, because the theory of neutralization itself has not been changed in any way. All that has been required is that the theory be applied in a uniform and non-arbitrary manner. There is no non-arbitrary means for deciding that one archiphoneme (partially specified segment with respect to the defining features of the phoneme) should be included in the description to the exclusion of another. They must all be included, or the theory must be modified to exclude those it is desired to exclude. If the full application of the theory results in an increased number of partially specified segments (and this is by no means detrimental, as will be shown), the increase was implicit in the theory all the time.

The complete application of the theory of neutralization adds considerably to the adequacy or power of a description with respect to at least three points. First, it supplies a detailed specification of phonological redundancy which, given the importance of the latter to the communicative function of language,

requires at the very least a full statement for further study.

The extent to which neutralization occurs in a language has not always been realized. Martinet, for example, believed (1949a, p. 13) that the concept of neutralization is little used among English-speaking scholars because the English language makes little use of redundancy. English, however, makes considerable use of the phenomenon (see Berger, 1949), and an adequate description should specify this fully. Second, in determining the functional yield or distinctive use of an opposition, the study of totally redundancy-free archiphonemic representations rather than minimal pairs gives a more accurate means of calculating this yield.⁶ Third, and of fundamental importance, much of the information formerly supplied by the phonotactical statements is already incorporated into the archiphonemic level of representation through the

⁶ Given the importance assigned to the role of functional yield in sound change (see Martinet, 1955, *passim*), the precise calculation of this yield is of particular importance. For a critical analysis of this role, see King (1967).

removal of all sequential redundancies.⁷ Consequently, a full application of the theory of neutralization removes the need for any separate statements of the phonotactics, and simplifies the grammar considerably.

The phonotactical rules, if included in a grammar, provide a compact statement of observed phoneme sequences, and make a distinction between observed sequences and non-observed sequences (accidental gaps). Postal, however, illustrates (1968, p. 164) a fundamental difficulty with these rules: such statements have no way of distinguishing accidental gaps from cases of neutralization. Generative phonology, operating with a redundancy-free systematic phonemic level of representation and with rules specifying redundant features, provides as a natural consequence of these rules a means of making this distinction.⁸

3.5. Levels of Representation. Various phonological theories generally concern themselves with three levels of representation:

⁷ Certain phonotactical information, such as the non-occurrence of /ŋ/ in initial position or of /t-d-č-š/ before /l/ in English, cannot be handled in terms of neutralization, since, for example, these latter four phonemes, within the feature framework used in functional-structural phonology, are not in exclusive relationship, and their opposition to the other English phonemes cannot be neutralized. In different terms, these phonemes do not form a natural class (do not require fewer features to designate the whole class than to designate any of the individual members).

⁸ Functional-structural phonology, although possessing the theoretical equipment to make such a distinction, does not yet appear to have done so.

phonetic, phonemic, and a third higher level, variously called the morphophonemic, archiphonemic, or systematic phonemic.⁹ The phonetic level is considered the most concrete in that it is most directly related to the data concerning the production, transmission, and reception of speech sounds. In addition to this, linguistic theories have generally considered other, more abstract levels: the phonemic, related to the phonetic through the removal of all feature redundancies within the same segment,¹⁰ and the archiphonemic or systematic phonemic (to name the two of central concern in this study).

The archiphonemic level, within functional-structural phonology, is obtained from the phonemic level by the removal of all further, sequential redundancies. Comparably, within generative phonology, the systematic phonemic level also excludes all redundancies, but unlike the archiphonemic representation, it does contain grammatical information.

⁹This in no way means to imply that these three treatments of this higher level are equivalent, merely that they are in some sense higher or further removed from the phonetic level.

¹⁰Actually, there are a number of other crucial requirements imposed on the relationship between this and the phonetic level. For an extended discussion and criticism of these requirements, and alternative proposals, see Chomsky (1964, pp. 85-112).

Furthermore, certain procedures are permitted in converting this level of representation into the phonetic level that are not permitted in the functional-structural approach to phonology.¹¹ The archiphonemic and the systematic levels, however, in addition to being free of redundancies, are alike in another essential respect. The relationship between the entities on these levels (and consequently on the intermediate phonemic level, if it is included) and the entities on the phonetic level is not arbitrary: the units are described in terms of the same set of phonological features (irrespective of the particular set of features chosen). This requirement, called the naturalness condition by Postal (1968, pp. 55-56), implies that many of the characteristics of the relationship between the two levels are common to all languages and may be described within a general theory of language. Consequently, these universal characteristics do not require stating in individual grammars dealing with specific languages.

¹¹For example, the rules which convert the systematic level directly into the phonetic level may add, delete, or rearrange segments, and no passage through an intermediate level of phonemics is required.

Halle has acknowledged that the incompletely specified segments on the systematic phonemic level are "analogous to the Prague school's archiphonemes" (1959, p. 39). Halle goes on to specify that his generative phonological treatment of Russian operates with a set of incompletely specified segments that are "substantially identical with the archiphonemes postulated by Trubetzkoy" in Das morphonologische System der russischen Sprache TCLP V, 1934. As demonstrated above, the removal of all redundancies on either the archiphonemic or the systematic phonemic level obviates the need for any independent phonotactical rules, since all distributional possibilities are already accounted for. As soon, however, as phonemes are introduced as separate entities on an autonomous level between the above-mentioned levels and the phonetic level, the requirement of a separate set of phonotactic rules is re-introduced. Postal, after dealing specifically with Mohawk, makes this point forcefully in arguing that an autonomous level of phonemics needlessly adds to the complexity of grammars (1968, p. 213):

". . . if a description which contains restrictions on the combination of morphophonemes [read "archiphonemes"] in morphemes plus the morphophonemic rules is embedded in a grammar which defines the combinations of morphemes into words, all possible combinations of phonetic elements in words are necessarily predicted. But if, in addition, such a grammar contains autonomous phonemic representation, all of these restrictions will have to be repeated as part of the phonotactics in order to maintain the autonomous assumption that phoneme combinations must be characterized independently of the rest of the grammar."

Similar conclusions had been reached earlier by Hale (1965, p. 297) following his work on Papago phonology:

"To specify more exactly . . . which clusters can actually occur, and where, would require paraphrase of a subset of the morphophonemic rules, since the 'possible clusters' in Papago and their distributions, are automatically specified by a number of very general, independently motivated rules which impose a phonetic interpretation on the morphophonemic representation."

Such considerations concerning the relationship between phonotactics and neutralization can contribute to the arguments showing the superfluity of the level of autonomous phonemics, within functional-structural phonology as well as within systematic phonemics, since autonomous phonemics introduces additional complexity into the phonological descriptions without compensatory benefits, concerning this point at least.

3.6. Summary. The notions "neutralization" and "archiphoneme" have, it appears, been too narrowly applied. If applied to

their full extent, they specify all phonological redundancies, and include information formerly requiring separate statement. Generative phonology, using a systematic phonemic level comparable to the archiphonemic level (when totally redundancy-free) formalizes many of the notions discussed in this chapter.

CHAPTER FOUR

4.0. Purpose. Prior to the incorporation of a revised theory¹ of phonological markedness into generative phonology, the way this framework handled redundant feature information was relatively clear, at least in the sense that problem areas were fairly precisely delimited. The earlier generative framework, perhaps now more important for historical reasons than as an active area of theoretical development, involved only two levels of representation: the systematic phonemic and the phonetic. Special rules specified values for redundant features on the systematic phonemic level. An examination of these rules may help to clarify the later developments of markedness theory.

4.1. Structure of a Transformational Grammar. A transformational grammar consists of three components: the central, syntactic component, and two interpretive components, the semantic and the phonological. The syntactic component in turn consists of two parts: a set of base rules (plus a lexicon) which specify abstract strings of grammatical categories called deep structures,²

¹To be dealt with in Chapter Five.

²Langacker (1968, pp. 86-96, 103-106) uses the term "conceptual structure" to correspond to deep structure.

and a set of transformational rules which operate on deep structures transforming them into surface structures. The deep structures serve as the input to the semantic component, which provides the semantic interpretation of the sentence. The surface structures form the input to the phonological component, which ultimately gives the phonetic representation of the sentence. As mentioned above, the lexicon is also included in the base part of the syntactic component. Lexical entries, consisting of complexes of phonological, syntactic, and semantic information concerning individual lexical items, are inserted into the deep structures as terminal elements before the operation of either the transformational or the semantic interpretation rules.³

With respect to the phonological aspect of lexical entries, there is in generative phonology a principle of monomorphic representation which requires that all lexical items (except suppletive forms) be listed in the lexicon in a single base form. From this abstract base form, phonological rules, which in order to avoid duplication of statement, are made as general as possible, derive the different allomorphs of this lexical item (or grammatical morpheme, for that matter) in

³For a detailed description of the concept of grammar outlined here, see Chomsky (1965).

different contexts. This requirement on phonological descriptions is incorporated in Halle's Condition (4) (1959, p. 24),⁴ which states that:

"The phonological description must be appropriately integrated into the grammar of the language. Particularly, in selecting phonological representations of individual morphemes, these must be chosen so as to yield simple statements of all grammatical operations -- like inflection and derivation -- in which they may be involved."

"base form" should be understood in the sense of "abstract phonological representation," not "principal allomorph."

The base form, according to Chomsky (1966, p. 57), need not be phonetically identical to any of the allomorphs:

". . . it is important to observe that the phonological matrix postulated as an underlying form may undergo significant modification in the course of derivation, and in fact, it is not unusual for the postulated underlying form to appear in none of the actual phonetic realizations."

The base form is set up instead so that the universal phonological process and language-specific phonological rules derive from it in the simplest manner possible all morphologically related forms.

Because the lexicon is part of the base component of a transformational grammar (as so far established) and because

⁴Halle's six conditions (1959, Chapter One) form the basis of an integrated theory of phonology; conditions three, four, and five are relevant to this discussion.

individual lexical items are inserted into the output of this part of the grammar before the operation of any phonological rules (or semantic rules), it follows that certain information is available to the phonological rules in a generative grammar that is not available in other theories of language. That is, the phonological rules may refer to grammatical category membership (noun phrase, verb phrase, noun, verb, etc.) and to any boundaries (morpheme, word, phrase, etc.) specified by the grammar. This availability of extra-phonological information is one of the chief differences between generative and other types (that is, autonomous types) of phonology.⁵

There is a further requirement in generative phonology that no redundant information be specified in the lexicon, incorporated by Halle in the form of a condition (1959, p. 29):

"In phonological representations, the number of specified features is consistently reduced to a minimum compatible with satisfying Conditions (3) and (4)."⁶

⁵The type of grammatical information admitted by Pike "amounted to only a small percentage of the kinds of nonphonetic, grammatically determined properties which systematic phonemics now insists are relevant for phonetic interpretation" (Postal, 1968, p. ix).

⁶Condition (3) corresponds to half of the biuniqueness principle in phonology, and requires that "a phonological description must provide a method for inferring (deriving) from every phonological representation the utterance symbolized, without recourse to information not contained in the phonological representation." (Halle, 1959, p. 21). For Condition (4), see p. 38, above.

Lexical items, in their phonological aspect, are symbolically represented as matrices, called dictionary matrices by Stanley, with vertical columns corresponding to particular segments and horizontal rows to distinctive features. The (binary) specifications for all redundant features are left blank (or alternatively marked with 0). It is these redundancy-free lexical representations which are analogous to the archiphonemic level of functional-structural phonology, for example. There is a need somewhere in the grammar for rules which specify the plus or minus value of phonological features left unspecified in the lexicon.⁷ These rules are called morpheme structure or phonological redundancy rules within generative phonology, and are the means by which this framework handles neutralization. That is, these rules express the sequential constraints on combinations of distinctive features.

4.2. Redundancy Rules. Redundancy rules are of two types, generally called segment structure and sequence structure rules (or context-free and context-sensitive⁸ redundancy rules respectively). The segment structure rules fill in blanks in

⁷ Rules also specify the values of redundant syntactic or semantic features. For example, in English, all +human nouns are +animate.

⁸ These last terms are actually inappropriate, as Professor J. Creore has pointed out (personal communication), since all redundancy rules are context-sensitive, either to segmental or sequential context.

particular segments in dictionary matrices on the basis of information (feature specifications) contained only within those segments. Sequence structure rules, on the other hand, fill in blanks on the basis of information in neighbouring segments. For example, in a description of French, a segment structure rule would specify that all segments which are [+vocalic] are [+voice].⁹ A sequence structure rule would specify that any segment following three morpheme-initial [+consonantal] segments is [+vocalic] and [-consonantal]. Therefore it is properly the sequence structure¹⁰ rules which specify the values of neutralized features (or oppositions), which have been left blank in dictionary matrices because of sequential constraints.

It is necessary to distinguish between redundancy rules and phonological rules proper, and Stanley proposes (1967, p. 397) that:

"redundancy rules be clearly distinguished from rules which change feature values; the former are rules which state redundancies at a single level, while the latter are rules which map one level onto another."

⁹ In this and the last chapter, all features, unless otherwise specifically stated, will be from the Jakobsonian framework.

¹⁰ This is strictly analogous to the functional-structural concept of neutralization, where the suspension of a distinctive opposition is determined by the phonological context.

Redundancy rules only fill in redundant information in dictionary matrices. Phonological rules may add, delete, or rearrange segments, and change feature specifications in the course of converting the systematic phonemic representation into the phonetic representation.¹¹ Possibly as a result of a failure to make this distinction clearly, there has been a certain equivocation regarding the place of redundancy rules in a grammar. Halle (1959), for example, scatters some redundancy rules throughout the phonological rules. Other linguists¹² have considered the redundancy rules as a separate part of the phonological component or as part of the lexicon. These rules, however, are now placed in a readjustment component which modifies the output of the syntactic component before the phonological rules proper operate on this output; that is, the output of the syntactic component and the input to the

¹¹The ability of generative phonological rules to add, delete, permute, or change segments also violates the constraints placed on an autonomous approach to phonology. Within functional-structural phonology, for example, it is possible to view the phonemic level as a redundancy-free version of the phonemic. On these higher levels, however, the segments cannot be rearranged or deleted with respect to the corresponding segments on the phonetic level; they must remain in the same relative position. No corresponding requirements are placed on the units on the systematic phonemic level.

¹²For example, Harms (forthcoming), McCawley (1965).

phonological component do not coincide perfectly:

". . . the grammar must contain certain rules converting the surface structures generated by the syntactic component into a form appropriate for use by the phonological component." (Chomsky and Halle, 1968, p. 9).

The functions of readjustment rules, in addition to introducing values for all redundant features omitted from the dictionary matrices, include modifying the labelled bracketing of the surface structure to account for phonological phrases, and constructing new feature matrices for lexical and grammatical formatives which do not follow regular phonological processes.

Although it was always assumed that some of the redundancy rules had to operate before some of the phonological rules, in recent formulations all redundancy rules operate on fully specified segments (segments with all feature values indicated in binary terms). Stanley has shown (1968, pp. 413-414) that by having the phonological rules operate on fully specified segments, certain problems involving the operation or non-operation of these rules are avoided.¹³ Stanley calls the level

¹³The problems involved specious simplifications obtained by allowing "blank" or "zero" to determine whether or not a rule applies. Generative phonology operates strictly with binary features, and if "blank" functions to determine rule applicability, the features are no longer binary but ternary, and among other things, the evaluation procedure proposed by Halle (1962) does not apply to ternary features.

obtained after the operation of the redundancy rules the level of systematic phonemics;¹⁴ that is, the systematic phonemic level is fully specified. Stanley's formulation differs to a certain extent from that of Zwicky (1965), however. The difference is more than a terminological one; (see Section 4.4.).

4.3. Problems Involving Redundancy Rules. There are certain problems involving the way sequence structure rules are made to apply to redundancy-free matrices. For example, neutralization can operate across morpheme boundaries, and it is desirable, therefore, that the morpheme structure rules, if they are to handle neutralization, reflect this fact. But this is equivalent to saying that the morpheme structure rules, like phonological rules, can describe structural changes that occur in morphemes when they are combined in linear sequence, as in, for example, the hypothetical case of a language in which voicing is distinctive in morpheme-final position in single consonants, but in which clusters of two consonants must agree in the feature of voice, the first consonant assimilating to the second. If this constraint operates as well across morpheme boundaries and if a morpheme with a final voiced consonant is juxtaposed to a morpheme beginning with a voiceless consonant, then the feature of voice in the initial consonant of the resulting cluster

¹⁴The origin and justification of this term are given in Chomsky (1964, p. 87),

becomes redundant. However, the redundancy rule covering this fact will have to specify the feature as "minus", a change from the original lexical entry. Given this example, it is possible to conclude that the proper place for some redundancy rules, if they are to change feature values, is among the phonological rules, when the rule applies both within and across morpheme boundaries. But as noted above, this rule location has the undesirable consequence of requiring that certain phonological rules operate on incompletely specified segments. As a solution, Stanley proposes (1967, p. 404) that all redundancy rules, both segmental and sequential, operate prior to the phonological rules, but that they be allowed to reapply automatically to the output of any phonological or syntactic rule should the rule exhibit the same redundancies. The formal means of incorporating this solution into the structure of particular grammars has not yet been finalized, as Stanley admits (p. 405): "Yet it is, at this point, not at all clear how the details of such a convention are to be worked out." More work in specifying the redundancies of particular languages would help in this respect.

4.4. The Systematic Phoneme. Stanley's definition of the level of systematic phonemics involves fully specified segments; that is, systematic phonemes exclusively. This differs sharply from Zwicky's (1965, pp. 7-8) conception, according to which

the systematic phonemic level may contain partly specified segments (unspecified features):

"If x occurs as a segment in a lexical entry, and if no other segment includes x (in the set theoretic sense), then x is a (systematic) phoneme."

According to this generally accepted definition, systematic phonemes, as a set of segments abstracted from the systematic phonemic level, are fully specified with respect to the defining features of the phonemes (but not with respect to non-distinctive features). They are fully specified because they are abstracted from this level as a set of fully specified segments; that is, the most fully specified segments on this level. The level itself may contain other, incompletely specified segments which are not distinct from¹⁵ the systematic phonemes, but the blank specifications arise from sequential rather than segmental constraints. For example, in Zwicky's sense the systematic phonemic level could contain the two segments:

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Zwicky has also formally stated the definition for "distinct": "a segment x is distinct from a segment y if and only if there is a feature f such that +f is in x and -f is in y, or -f is in x and +f is in y." (p. 6).

| | | | |
|-----|---|-----|---|
| (a) | <ul style="list-style-type: none"> - vocalic + consonantal - compact + diffuse - grave - continuant - nasal + tense - strident | (b) | <ul style="list-style-type: none"> - vocalic + consonantal - compact 0 diffuse - grave - continuant 0 nasal 0 tense 0 strident |
|-----|---|-----|---|

where (a) is the systematic phoneme symbolized by $|t|$, and (b) is a segment on the systematic phonemic level whose defining features are included in those of (a). Therefore in this scheme (a) is a systematic phoneme but (b) is not. In Stanley's formulation, only segments of type (a) occur on the systematic phonemic level. It is a requirement placed on systematic phonemes that they be distinct. Accordingly, Zwicky's systematic phonemes are defined by the output of the context-sensitive redundancy rules (if all these rules precede the context-free rules) because all segments are distinct following the application of the former rules. Therefore, Zwicky's level of systematic phonemics corresponds to Stanley's level of dictionary matrices. In current research, strong considerations against any ordering of the redundancy rules¹⁶

¹⁶ Basically, the redundancy rules do not need to be ordered because the final output of these rules will be unchanged no matter in which order the rules apply nor how many times they apply. Any order imposed, therefore, is of a trivial nature. In phonological rules, on the other hand, rule ordering, because of the possibility that rules can change feature specifications, plays a crucial role in determining the final output of the rules. In functional-structural phonology as well, statements which convert the archiphonemic to the phonemic level, or the phonemic to the phonetic level, are not ordered.

support Stanley's interpretation of the systematic phonemic level as fully specified. Stanley goes even further, however. He shows that by adopting the notion of morpheme structure condition rather than morpheme structure rule (thereby reserving rules for statements which convert one level into another), it is possible to avoid the problems of rule applicability and specious simplifications. Furthermore, it is also possible to do away with the distinction between dictionary matrices and systematic phonemic matrices.

4.5. Morpheme Structure Conditions. Given a set of all logically possible segment sequences in a language, a subset of this set corresponding just to the sequences permissible according to the segmental and sequential constraints on feature combinations within the language may be defined.¹⁷ It is the purpose of the morpheme structure conditions to define this subset. The morpheme structure conditions are unordered, and do not fill in blanks in matrices, but instead state the criteria for admission to the set of possible matrices. Stanley has shown (1967, pp. 425-428) that three different kinds of morpheme structure conditions are required: if-then conditions, positive conditions, and negative conditions. An if-then condition requires that if a segment (or sequence of segments) satisfy the "if" part of the condition, it must also satisfy the "then" part to be admitted as a possible morpheme. A

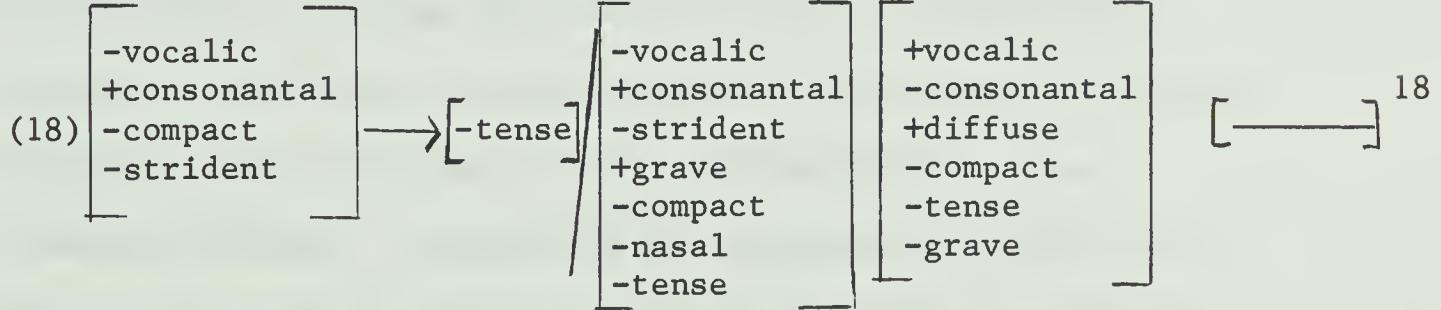
¹⁷ That is, both segment and sequence structure conditions, analogous to segment and sequence structure rules, occur in the description.

positive condition requires that all segments must meet the condition to qualify as admissible. Conversely, a negative condition states that no segment or segment sequence meeting the condition may be admitted to the set of possible morphemes.

For a more complete description of morpheme structure conditions and their formal aspect, see Stanley (1967, pp. 424-435).

The set of all permissible sequences defined by the morpheme structure conditions will contain non-occurring but permissible sequences (accidental gaps). These non-occurring sequences are admitted to the set of possible morphemes because the statement or the morpheme structure condition (or rule in earlier formulations) which prohibited them would require mention of more features than would be accounted for or "saved" by the condition. Halle (1962, p. 61) illustrates this admissability with reference to the possible English word /bIk/:

". . . since big, bin, bid, bit, biff, bib are all English words, the rule or condition that excludes /bIk/ would have to read:



And at the cost of 18 features mentioned in (18) we could effect a saving of one feature in the dictionary. The simplicity criterion, therefore, does not allow us to include (18) in a description of English."

18

Or, in a prose statement, the segment which is -vocalic, +consonantal, -compact, -strident becomes -tense in the environment following /bi/.

Consequently, as the preceding example shows, morpheme structure conditions (or rules) provide a means of differentiating accidental gaps from neutralizations, because rules filling in feature values for gaps in the lexicon are excluded from the grammar by the simplicity criterion. The same criterion, however, requires the inclusion of rules or conditions accounting for neutralized features, since these features can be predicted by a single general rule and do not require specification in each individual lexical item.

Stanley suggests as well (1967, p. 434) that it is possible to abandon the distinction between partially and fully specified matrices (dictionary and systematic phonemic matrices) and to retain the evaluation procedure that formerly counted the number of blanks in the dictionary matrices. Instead, in general terms, the evaluation procedure assures that the morpheme structure conditions contribute to the simplicity of the grammar by counting the number of features used to state individual conditions, and requiring that this number be smaller than the number of features in the lexicon for which the condition accounts. Considering the systematic phonemic and dictionary matrices as identical, that is as fully specified, raises certain difficulties, however. To do so implicitly incorporates the claim that redundant information is stored in the grammar. At least as concerns the formal theory of grammars, this claim is undesirable since it contradicts Halle's Condition (5)

on phonological descriptions, which requires that the number of feature specifications be minimized (see page 39, above). Thus, even though the formal apparatus for counting redundancies in a fully specified level exists, the availability of this evaluation procedure does not justify the specification of the redundancies in the first place. The impracticality of including redundancies is particularly evident in the case of features which would have to be specified in the final phonetic description of a language, but which play no distinctive role in that language. For example, in French, no segment makes distinctive use of the features of glottalization, pharyngealization, rounding (in consonants), lateralization, etc. Yet in a final phonetic description of French, they must all be accounted for. However, because generative grammar does not incorporate a level of autonomous phonemics, it is unclear where the specification of these features is to take place.¹⁹ If they are specified by the segment structure rules (as they may be), this specification introduces a considerable unnecessary redundancy into the matrices considered by the phonological rules. Furthermore, the inclusion of these features in a definition of the systematic

¹⁹ In functional-structural phonology, these features are specified in the statements which convert the phonemic to the phonetic level.

phoneme (as is possible under Zwicky's formulation) is undesirable, because the systematic phonemes should be minimally distinct. The features could be specified by the post-cyclical²⁰ (late phonetic) rules, but this specification would seem to contradict the purpose of these rules, which is generally considered as having to do with the conversion of binary specifications to n-ary specifications corresponding to vocal tract behaviour, rather than with the introduction of specifications. There is no widely acceptable solution to the problem in "older" redundancy theory.

4.6. Conclusion. The use of blanks and special rules (the morpheme structure rules) or conditions as a theoretical means of handling redundancy has been largely superseded. Because of the inadequacies of the older generative theory, a new approach arising in part out of the requirements of the naturalness condition, and offering the possibility of establishing connections between phonology and other areas of

²⁰The late phonetic or post-cyclical rules are generally considered as an unordered set of rules following the cyclic phonological rules (for an explanation of these, see Chomsky and Halle, 1968, p. 15) which require no grammatical information for their operation, and which adjust binary specifications, where necessary, to correspond to the phonetic reality.

related investigation, has been developed. This approach is based on a revised concept of markedness and on considerations involving universal characteristics of human language.

CHAPTER FIVE

5.0. Purpose. The theory of generative phonological markedness is based to a large extent on the earlier work of Trubetzkoy, but differs from it in significant respects.

There is considerable evidence in support of the newer theory,¹ but its exact form and the means of incorporating it into a generative grammar require further specification.

5.1. The Naturalness Condition. Much of the motivation for the newer markedness theory comes from what has been called the naturalness condition (Postal, 1968, p. 55). As summarized in Chapter Three, the naturalness condition requires that in the descriptions of all languages, the relation between the phonetic and the phonological levels be a natural one. This apparently simple and redundant statement has important and far-reaching results. For example, Postal asserts (1968, p. 56) that the naturalness condition is to be interpreted as:

¹For example, from the areas of language acquisition and pathology, physiology, the structure of sound systems, and the nature of the distinctive features. See below, section 5.3.

"Claiming that the categorization of lexical items given by phonological structure, i.e. required to represent morphemes in the dictionary, required to state morphophonemic and phonological rules, needed to state constraints on sequences of phonological elements, needed to state phonological universals etc., is not, from the point of view of phonetic structure, an arbitrary code. Rather, this representation is closely related to the representation needed to state the phonetic properties of the various sequences which represent individual lexical items."

Chomsky and Halle (1968, p. 295) state this condition in a similar way:

"The phonological features cannot be chosen arbitrarily, for the phonological component would then have to include a huge number of ad hoc rules of the type

$$\begin{array}{lcl} [+A, -B, -C, +D] & \longrightarrow & [hʌt] \\ [-A, -B, -C, +D] & \longrightarrow & [rʌt] \\ [-A, +B, -C, +D] & \longrightarrow & [\partial lɪps] \end{array}$$

Moreover, if we represented lexical items by means of an arbitrary feature notation, we would be effectively prevented from expressing in the grammar the crucial fact that items which have similar phonetic shapes are subject to many of the same rules."

They add (p. 296) that not only is the representation of lexical items non-arbitrary, but that it cannot correspond to the phonetic form of the item either, because a single lexical item frequently has several phonetic shapes depending on context. If a single phonetic form were chosen, its choice would have to be justified, but this cannot be done, since it can be shown that "many of the most general and deep-seated phonological processes cannot be formulated as rules that directly relate

phonetic representations, rather these processes presuppose underlying abstract forms." The connection between the phonological and the phonetic representations, therefore, lies somewhere between identity and total arbitrariness. By the terms of the naturalness condition, the connections should be made as non-arbitrary as possible, since, again following the formulations of Chomsky and Halle (1968, p. 296):

"the more abstract the lexical representation the further removed from the phonetic, the greater will be the number and complexity of the phonological rules required to map it into a phonetic transcription. We therefore postulate abstract lexical entries only where this cost is more than compensated for by greater overall simplification -- for example, in cases where the combination of abstract lexical entries and a set of rules permits the formulation of phonological processes of great generality that would otherwise be inexpressible."

Furthermore (p. 247), the connection between the phonetic and the phonological levels of representation does not vary from language to language:

"The relation between data and grammar is, we naturally assume, language independent: there is no basis for supposing that individuals differ generically in their ability to learn one rather than another natural language. Consequently, the relationship is determined by a principle of universal grammar."

5.2. Markedness Theory. Markedness theory has been proposed to account for this universal relationship. Its formulation must be general enough to account for the widely divergent possibilities of linguistic expression, but specific enough to

be a useful, workable description of human language. Because it is language-independent, that is, because it is a theory of human language rather than of individual human languages, the information it accounts for does not have to be stated in individual grammars, and the economy in the resultant descriptions is considerable.

The notion of the marked versus the unmarked member of a pair of phonemes was treated by Trubetzkoy in Principes de phonologie (p. 77):

"Les oppositions privatives sont celles dans lesquelles un des termes de l'opposition est caractérisé par l'existence d'une marque, l'autre par l'absence de cette marque: par ex. "sonore" - "sourde," "nasalisé" - "non-nasalisé," "arrondi"- "non-arrondi." Le terme de l'opposition caractérisée par la présence de la marque s'appellera "terme marqué" et celui qui est caractérisé par l'absence de la marque "terme non-marqué."

He defines (p. 89) a mark of correlation as:

"une particularité phonologique par l'existence ou la non-existence de laquelle une série de paires correlatives est caractérisée (par ex. la nasalité vocale qui, en français, différencie les paires correlatives an-a, on-o, in-e, un-eu)."

Trubetzkoy specifies the member of a pair of phonemes which appears in the position of internally conditioned neutralization as "unmarked":

"Autrement dit, tout terme d'opposition qui est admis dans la position de neutralisation est, au point de vue du système phonologique en question, non marqué, tandis que le terme opposé est marqué."

The proposals, however, did not seem to account for certain difficult problems. For example, given Trubetzkoy's set of features (or Martinet's) it is difficult to determine which member of the pair /p-f/ is marked. Is /p/ marked by the presence of occlusivity, or is /f/ marked by the presence of fricativity? Furthermore, given the pair of English words wetting-wedding, both pronounced [wɛdɪŋ] in some dialects, the opposition /t-d/ is neutralized in intervocalic position, following stress, but it is the marked (voiced) member of the pair which appears. Because of counter-examples like these, Trubetzkoy's theory of markedness has been revised.

Generative markedness theories have utilized these earlier ideas of Trubetzkoy as a partial basis for newer formulations. The idea of "unmarked" has been substantially reinterpreted to mean "normal, usual, or expected" in human language, rather "absence of a certain phonological characteristic." The interpretation of "marked" as "positive member of an opposition characterised by the presence of a given feature" was responsible for certain of the difficulties in Trubetzkoy's formulation. In generative markedness theories, the unmarked member of a pair may be characterized by the presence of the feature in question (as for example voice in vowels) or its absence, just so long as the feature specification, + or -, is the one which would normally be expected. Further,

the marked status of a feature with respect to a particular segment may vary depending on the specific context (initial, medial, in clusters, etc.) in which the segment occurs. For example, the unmarked status of consonants invervocalically may be voiced.² Finally, the generative theory of markedness depends on a fixed set of phonological features (the discovery of which is still a major area of research). It is not possible to substitute "lax" for "tense" in the feature matrices, for example.

There is at present a clear difficulty in defining "unmarked" or "normal" from the generative point of view. It appears that at least in some cases the normal condition of a segment³ is statistically determined, and it is not clear just what role statistical considerations play in deciding normality. Perhaps ultimately normality is totally statistically based. The situation could arise, hypothetically at least, that

² Any statements of interpretation are tentative. As J. Harris says (1967, p. 75): "It would be pointless to state how the marking conventions proposed by Chomsky and Halle would affect these rules [Harris' rule of Spanish phonology], since these marking conventions are undergoing substantial revision at this writing.

³ The use of the concept of neutralization is not restricted to phonology. For examples of its application to morphology, see Jakobson, "Signe zéro" in his Selected Writings, Greenberg, Language Universals, especially Chapter Three, and Saporta, "Morpheme Alternants in Spanish" in Kahane and Pietrangeli, pp. 15-162.

fifty percent of the time one specification occurs, fifty percent another, and that there be no effective way of determining the unmarked status of a feature. Fortunately, situations of this type have not yet been encountered (if indeed they ever will be), and it will be useful to examine the various types of information and evidence that have been advanced in support of generative markedness theory, including earlier formulations.

5.3. Supporting Evidence. Trubetzkoy noticed that in cases of internal conditioning, it was usually the unmarked (or extreme) member of the opposition that served as the phonetic representative in the position of neutralization. This has been incorporated into generative markedness theory, a point to be discussed below. Trubetzkoy noticed further that the unmarked member of a pair had a greater frequency of occurrence. Greenberg (1966, pp. 58-59) discusses further characteristics of the unmarked member, namely greater allophonic variation (for example, the voiceless versus the voiced consonants in English), greater independence from its environment, and the fact that the number of unmarked phonemes with respect to a particular feature is always greater than or equal to, but never less than, the number of marked phonemes. For example, in vocalic systems the number of nasal vowels is always less than or equal to the number of oral vowels. The preceding criteria for markedness, obtained strictly from a study of phonologic

systems, are incorporated into generative markedness theory. There is also information reflecting on the marked-unmarked distinction from the fields of language acquisition and pathology, and the anatomy of the vocal apparatus. Children, for example, learn certain sounds before others, and the first-learned sounds often correspond to the unmarked ones. Jakobson (1949, pp. 370-371) notes the earlier acquisition of labials and dentals over velars and palatals, occlusives over fricatives, front unrounded vowels over front rounded vowels, oral vowels over nasal vowels, etc. He observes further that "les oppositions relativement rares dans les langues du monde sont parmi les dernières acquisitions de l'enfant" (p. 371). Where there is a progressive loss of language ability with respect to phonology, an analogous situation arises; the first sounds lost are the more complex, marked ones (p. 372):

". . . dans les troubles du langage, les voyelles nasales tendent les premières à disparaître, de même l'opposition des liquides est apte à s'amuir, les voyelles secondaires succombent plutôt que les primaires, les constrictives et les mi-occlusives se changent en occlusives, les consonnes vélaire sont perdues avant celles de l'avant bouche, et les consonnes labiales ainsi que la voyelle A sont les derniers phonèmes résistant à la destruction, ce qui correspond exactement au stade initial du langage enfantin . . . Les dégâts aphasiques reproduisent à l'envers l'ordre des acquisitions enfantines."

Finally, as Postal has pointed out (1968, p. 171), certain classifications into marked and unmarked segments may be made on

the basis of the structure of the human vocal apparatus; for example, the unmarked status of apicals may be attributed to the fact that "the dental region is the closest to the tip of the tongue starting from the rest position of the apparatus." Anatomical considerations also support the marked status of voicing in consonants (in initial position) and its unmarked status in vowels.

These considerations in effect illustrate the assymetric nature⁴ of the distinctive features. That is, not all such phonological elements have equal status, as is shown by the facts that they are not all learned at the same time; they are not all equally widespread in the world's languages -- some are very common while others very rare⁵ -- they do not occur equally in positions of neutralization, etc. A theory of markedness, specifically the generative theory of markedness, because it takes into account the expected, normal, or most

⁴In discussing historical change, Martinet assigns considerable importance to the assymetric nature of the vocal apparatus, and consequently to the phonological features. See Martinet (1955, pp. 95, 107) and his Preface to Haudricourt and Juillard (1949).

⁵With reference to the five consonants /p t k s n/, Chomsky and Halle say (1968, p. 413): 'It is significant that these five consonants are rarely absent in the phonological system of a language.'

frequent state of a feature and assigns it a special, unmarked status, can account for such phenomena. Generative markedness theory also accounts for the fact that several features (for example, nasality, glottalization, rounding in front vowels, laterlization, etc.) cannot be specified "plus" in a language unless other segments are specified "minus" for the same feature, since, as Postal says (1968, p. 178):

"Marked values in this case "plus" entail a contrast.

Wherever there is no contrast, U markings must occur." Thus, generative markedness theory concerns itself with a wide variety of phenomena.

5.4. Incorporation of Markedness Theory into a Grammar.

Generative grammar incorporates the theory of markedness through the introduction of a new level of representation. On this level, lexical items are represented as matrices of features specified not in terms of "plus" or "minus" but in terms of "m" or "u" (for "marked" or "unmarked").⁶ Universal interpretive conventions⁷ provided by the meta-theory (which consequently do not require stating in individual grammars) convert the "m" and "u" specifications into "plus" or "minus" specifications. In

⁶In their preliminary formulations of this theory, Chomsky and Halle (1968, p. 404) include '+' and '-' specifications on this level as well.

⁷For a set of such conventions, which, however, are undergoing modification (see above, p. 59, note 2), see Chomsky and Halle (1968, pp. 402-408).

determining the complexity of a particular description, only the features which are abnormal ("marked") with respect to what would normally be expected in a language are counted.⁸ Therefore, in constructing a grammar it becomes incumbent upon the linguist to make maximum use of the universal interpretive conventions, removing as a consequence the need for language specific rules, for example, in specifying the structure of lexical items, in order to:

"represent forms phonologically in ways which will yield the derivation of their phonetic forms by way of the maximal utilization of the universal interpretive principles." (Postal, 1968, p. 62).

But this, in effect, is just what the naturalness condition has required all along:

"Other things being equal, the more direct the relationship between classificatory and phonetic matrices, the less complex -- the more highly valued -- will be the resulting grammar. In so far as language-specific rules are proposed that express an indirect relation between classificatory and phonetic matrices, these rules must be justified by showing that they lead to economies in other parts of the grammar that more than compensate for the complexity that they introduce." (Chomsky and Halle, 1968, p. 387).

⁸The evaluation procedure presupposes a complete and correct theory of what is normal in human language. The absence of such a theory at the present time, however, does not prohibit the positing of tentative theories, such as the one sketched here, for confirmation or falsification.

The introduction of a new level containing "m" and "u" specifications helps to solve the problem mentioned in Chapter Four regarding whether or not the dictionary matrices are fully specified. On this new level, they are fully specified in terms of "m" and "u" because every feature must either have a normal or an abnormal status in these representations. There are no problems involving the application of the evaluation procedure to this level (as there were in evaluating a level fully specified in terms of "plus" and "minus") since it is a simple matter to count the marked features. Furthermore, there are no problems involving the application of phonological rules to incompletely specified segments, since the output of the interpretive conventions that apply to the level of "m" and "u" markings is a level that is fully specified in terms of "plus" or "minus".

5.5. Markedness and Redundancy. The level of "m" and "u" specifications and the general interpretive conventions have a significant effect on the specification of phonological redundancy. First of all, all levels are fully specified at all times in individual grammars, and redundancy is now dealt with in terms of universal constraints specified in the marking interpretation conventions. Neutralized features in certain positions will be specified "u" on the level of dictionary representation (because there is no opposition possible in that position), and changed into the appropriate "plus" or "minus"

specification by universal rather than by language-specific rules. For example, the neutralization of the voiced-voiceless opposition after /s/ in French is not a specifically French neutralization. Within generative markedness theory, it is to be expected in the terms of human language that there should be no such opposition in this position, and consequently the segment is specified [u voice], which is later converted to [- voice] by the meta-rules. Should some language have a voiced-voiceless opposition in this position (or should French develop one) the opposition would require a two-way specification of [u voice] and [m voice] for proper interpretation, and the marked feature would add to the complexity of the grammar.

Chomsky and Halle (1968, p. 416) present a comparable example:

"The interpretive conventions state not only constraints on feature combinations within segments, but also constraints on segment sequences. Thus convention (XXIV) dealing with continuants preceding consonants eliminates the necessity for a redundancy rule in English stating that in initial preconsonantal position the only admitted consonant is /s/. A consonant in this position may now be totally unmarked . . . , and the proper feature values will be supplied by the universal conventions."

Thus, they continue, in the newer formulations of markedness theory, "those redundancy rules that have any wide applicability in the grammar are simply eliminated in favor of universal interpretive conventions."

The universal interpretive conventions also solve the problem (mentioned on pp. 50, 51 above) involving features which are always non-distinctive in a particular language, such as glottalization, lateralization, etc. in French. Because there is no opposition involving these features, they will always be specified "u" in the lexical representations, at no cost according to the evaluation procedure, and will be interpreted by the universal conventions. No language specific rules, that is, will ever be required to interpret them, and the problem of where to place these rules and when they apply does not arise.

One further problem solved by the incorporation of a level of markedness into a grammar involves what were formerly non-unique lexical representations. Schane (1968b) has demonstrated that it is possible to allow the evaluation measure to determine which of two phonological representations should be chosen where there was formerly an apparently arbitrary choice between two equally possible underlying segments, for example, the nasal vowel of the French word vendre. Within a generative phonological framework, the phonetic segment [ã] may be derived either from a sequence of |en| or |an| (1968a, pp. 45-48). Because the stem has no related morphological variants to help decide the underlying representation, and because each sequence of systematic phonemes is equally complex in a binary feature notation, the choice between the two underlying

forms appears arbitrary. But if instead the level of markedness plus the evaluation procedure is employed, the representation [an] should be chosen, since a is the unmarked vowel in this case. If it had been necessary to operate in a framework of binary "plus" or "minus" features, either specification would have been of equal complexity, and no non-arbitrary choice would have been possible. "As a historical footnote," Schane admits (1968b, p. 22), "it is interesting that it is in a sense the Prague phonologists⁸ who have come to the rescue."

5.6. Conclusion. The development of the notions of archiphoneme and neutralization has been traced from their origin to their incorporation into present phonological theories, both autonomous and generative. It has been shown how a detailed consideration of the archiphoneme contributed to a redefinition of the phoneme as a bundle of distinctive features in order to account for the notion of "common element of two or more phonemes." It has been further shown how the notion of archiphoneme as first conceived was an attempt (in part) to account for phonological redundancy, and how the notion, if fully applied, provides a full description of the phonological redundancy of a language. A level comparable to a totally redundancy-free archiphonemic level was incorporated into early formulations of

⁸For example, the notions of archiphoneme and neutralization, distinctive feature, naturalness condition, and markedness, all originate here.

generative phonology. Finally, it has been shown that a great deal of redundancy itself may be dealt with by a set of universal interpretive conventions applied to a level specified in terms of the marked or unmarked status of particular features. The theory of markedness sketched here is in no way complete, as its originators state repeatedly, but represents an interim report on a great deal of current research. Among some of the major areas of research are the discovery of the correct sets of distinctive features and interpretive conventions, the establishment of a hierarchical relationship among the distinctive features, and the formal means of incorporating the interpretive conventions into the grammar, particularly with respect to their reapplication to segments introduced by the phonological and syntactic components. It has hopefully been the contribution of this thesis to show how the notion of phonological redundancy is involved to a significant degree in a great deal of this work.

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